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FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

NOV 1931



BRANCH OF RESEARCH

November, 1931

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HIGHLIGHTS

<u>Station Report</u>	<u>Paragraph Heading</u>	<u>Topic</u>
Allegheny	Forest Pathology	Mycorrhiza
Appalachian	Forest Influences	Effect of drouth
California	Logging and Milling	Value of trees
Central States	Woodland Grazing Locust Borer	Results of season
Northern Rocky Mt.	Range Studies	Erosion conditions
Pacific Northwest	Selective Logging	Caterpillar logging
Southwestern	Timber Growth Rio Grande Survey	Seed trees Erosion

(Over)

Management

Wood has been assembling the data collected at Camp Ockanickon for the past four years bearing on natural reproduction, particularly of chestnut oak. It took him two days to collect enough pitch pine cones at Camp Ockanickon to produce a little more than a quarter of a pound of seed. This is the shortest crop of pitch pine seed yet observed there.

Less than half the normal amount of rain fell at Ockanickon during November, and a mean temperature for the month of 8-1/2 degrees above normal caused many of the native pines to start a new growth from the winter buds. Wood has been comparing our brief weather record at the Camp with the long-term record at Philadelphia, in the hope of finding a close enough correlation to permit our generalizing on Ockanickon climate from the Philadelphia records.

Hough has completed a map of a large portion of the virgin timber tract on East Tionesta Creek, which we now find totals about 6,000 acres. This is unquestionably the largest tract of virgin timber remaining in our territory, and is probably not even approached in size by any other. He has been making further analyses of the frequency and abundance figures for the tree species, and of the data on lesser vegetation.

Forest Pathology

Types of Mycorrhiza in the Allegheny Region.

Collections of mycorrhiza made at various periods during the past summer and fall have been examined in detail microscopically. The most striking condition found was the large amount of poorly developed and intergrading forms of mycorrhiza. Rootlets which did not show external symptoms of mycorrhiza formation were infected by fungi in various degrees. In all excepting a few cases, the development was the same or similar to that found in well-developed mycorrhiza. Slight intercellular penetration along with a thin mantle was the most frequent condition, and this has been considered poorly developed mycorrhiza. Although a small number of collections have been examined, it appears that these types are more widespread in the region than well developed mycorrhiza. Their occurrence is taken as an indication of the predominance of a typical forest humus condition since well developed mycorrhiza have been collected mostly in older stands. They occur on nursery stock and may involve the entire root system of seedlings growing in close contact with others having well-developed mycorrhiza. Here they appear to be closely connected with growth; the well-developed mycorrhiza occurring on the more rapidly

growing seedlings and the entire relationship carrying through to the third year in case they are held in the nursery. After transplanting their behavior in growth and mycorrhiza formation is unknown. It is likely, however, that most of the poorly developed mycorrhiza are caused by the same fungi as the well-developed types, and that growth differences due to other causes, soil, and humus conditions account for the changed action of the fungi. At present nothing is known regarding the difference in effect of these forms on the host.

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APPALACHIAN FOREST EXPERIMENT STATION

General

The conclusion reached after an inspection of West Virginia forests was that if the deficiency in rainfall which has been accumulating since 1925 is not directly responsible for the death of the large number of trees noted as dead in this region, it is certainly an important contributing cause.

Fire Studies

Early in the month numerous severe fires largely on private land in the vicinity of Asheville gave Nelson and Sims an opportunity for observing the behavior of going fires. Incendiarism prompted by the need of employment was given as the chief cause for the great number of fires. Extremely dry weather, as partly reflected by a deficiency in precipitation of over 12 inches so far this year, contributed to the severity of the fires and difficulty of their control.

Forest Influences

A trough rain gauge designed by Hursh for mountain conditions was made up locally and installed during the past month on the Bent Creek Forest for standardization against standard weather bureau gauges. If this trough proves practicable a number of them will be made up and used in the study of the interception of precipitation by vegetation cover. In addition, an experimental installation for observing runoff on a small unit under vegetation cover has been made. It is found that great difficulty, due to steep slopes, rocks, roots and tree trunks, may be expected in attempting to make such installations of a definite and regular size. It is concluded from this experience that a representative unit of cover should be selected and the boundaries of the runoff

plot put in regardless of geometrical shape.

In the latter part of November, 1931, after an almost unbroken series of monthly deficiencies in precipitation extending over the past two years, soil moisture determinations were made for several representative cover types on the Bent Creek Experimental Forest.

The total cumulated precipitation deficit since January, 1930, was 27.99 inches; 15.87 inches during 1930 and 12.12 inches in 1931. (Normal annual precipitation, 50 year average - 40.28 inches). During the growing season (May-August) in 1930 precipitation was only 53 per cent normal; in 1931 it was 74 per cent normal for the corresponding period. Since growing season precipitation has not been conspicuously subnormal for these two years as compared with drought years, for instance, 1925 when the rainfall for the growing season was only 32 per cent of normal, serious and widespread injury throughout the forest has not been particularly noticeable. The cumulated effects of deficits in 20 out of 23 months, amounting to 27.99 inches, have been studied insofar as they affect soil moisture. Soil moisture determinations at Bent Creek, made in November by C. A. and M. S. Abell, bring out the following points:

On many of the dryer sites such as south, southeasterly and westerly slopes, exposed ridges, and old fields, the moisture content of the upper layers fell below the wilting coefficient of those soils, which is around 10-15 per cent (oven dry basis). On sites normally moist from seepage and ground water where the parent rock comes within a foot of the surface none of the soil held as much as 10 per cent moisture. Notwithstanding the drought, however, the upper three inches of cove bottom soil showed 35-45 per cent moisture and northerly slopes 18-25 per cent. The topmost layers on an area from which litter was raked annually contained only one-sixth as much moisture as adjacent soils over which this raked up litter had been scattered.

The nature and density of vegetation cover was found to influence the moisture content of deeper portions of the soil profile. Some of these results are summarized in the following table:

Cover Type	Soil		Soil	
	Moisture		Moisture	
	(Oven dry basis)		(Oven dry basis)	
	Soil Depth	Per cent	Soil Depth	Per cent
	Inches		Inches	
North Slope				
Clear Cut in 1930	6	15	12	15
North Slope				
Oak-Chestnut Type	6	10	12	13
Ridge. Old Field				
broomsedge-goldenrod	6	6	12	16
Ridge. Old Field				
Virginia pine	6	9	12	21
Rocky, shallow				
soil. Chest. oak	6	7	12	7
South slope.				
Oak - Chestnut	6	8	12	8
North slope.				
Chestnut	6	11	12	10
Cove. Yellow Pop.				
- Chestnut	6	38	12	37
Laurel-Pitch pine				
North slope.				
Burned 1925	6	20	12	20
Lower slope				
Oak - Pine	6	9	12	14
Lower slope				
Old field Shortleaf:				
Pine	6	15	12	22

Forest Management in North Georgia

Early in the month the Georgia party established three series of white pine planting test plots. Two thousand 2-year seedlings obtained from the Parsons Nursery were separated into 3 grades, the best of which was used in two series of spacing tests at the Georgia Mountain Experiment Station. Grade 2 stock was used in a 1/2 acre underplanting and the poorest grade brought back to the experiment station nursery at Asheville for transplanting and probable later use as replacements.

The greater part of November was spent in taking increment borings, D.B.H. ² height, and bark thickness data for a study of growth on the woodlands of the Georgia Mountain Experiment Station. About 1500 increment borings were taken and approximately 1700 trees were sampled for bark thickness.

Forest Biology

Burleigh spent the first week in November with Vernon Bailey of the Biological Survey in a study of the deer situation in Virginia. Due to a suspected overabundance of these animals in the tidewater counties there had been some agitation for the repeal of the doe law. The Virginia Game Commission requested the advice of the Biological Survey on the matter. A careful study showed that no preceptible surplus of deer existed.

Mr. Bailey spent some time with Burleigh in looking over possible sites near Asheville which would be suitable for the introduction of beaver. Late in November, 3 female beavers were released on a 4-acre pond on the Biltmore Estate. An effort is now being made to obtain a male beaver for the colony. Supervisor Mattoon, Sims and Barrett accompanied Burleigh on a visit to the pond five days after the animals had been released. All three beavers were seen and they had apparently become completely acclimated. Six small trees were found to have already been partially cut, two black gums, a crataegus, two Carolina hemlocks, and a small hickory.

Brewer's Blackbird, a western species not previously reported in North Carolina, was observed in some numbers near Asheville. Sufficient specimens of both sexes were taken to substantiate identification.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Pine Region

Field work for the season was completed at the Stanislaus Branch November 5 when the station was closed for the winter. Final measurements were made for seasonal diameter and height growth, the last soil moisture determinations were made, and seedlings grown at the instrument stations were excavated to measure root development. All screened plots and several seed beds were reseeded.

Height growth of all species ceased entirely by September 25. More than 95 per cent of the seasonal growth was completed by August 5. Lodge-pole started soonest, May 13, and completed 90 per cent of its growth

by June 15. White fir did not really start until June 5, but had completed 90 per cent of its growth by July 25. Sugar pine completed 95 per cent of its growth by July 5. Incense cedar grew most uniformly throughout the season.

Diameter growth was more prolonged and more uniform through the season. Several trees showed growth as late as October 12, although over 90 per cent of the growth was completed by September 1.

The two instrument stations, one clear cut, the other with a typical sale area reserve stand, showed little differences in all physical site factors except soil moisture and duration of high soil temperatures. The clear cut station showed uniformly higher soil moisture above 20 inches depth than the forested station, except in early spring. High shallow soil temperatures were interrupted by shadows at the forested station. Survival of seedlings was about the same at both stations, though growth was markedly better on the clear cut area. Root penetration was about the same at both stations, 18 to 23 inches, but the development of laterals was much better at the clear cut station, long laterals being developed at depths below 2 inches, whereas at the forested station no laterals of any size were developed at all. Soil moisture was present in available amounts to within 2 inches of the surface at the cleared station at the end of the season but at the forested station similar moisture percentages were present only at depth of 18 or greater.

Forestation

At Feather River Nursery the distribution of 1-1 stock for fall planting was completed during November, shipments having been made to the Shasta, Tahoe, Stanislaus, and Sierra forests. Each of these forests received approximately 5000 trees and will receive a similar lot next spring. Inasmuch as the extensive reforestation in the California Region is at present confined to the east slope of the Sierra Nevada with stock from the administrative nursery at Susanville, it is our present policy to limit the Feather River Nursery to the production of stock from west slope sources for west slope planting. Planting by the Experiment Station itself is at present limited to areas on the Plumas Forest, while the administrative organization does the planting on the other forests mentioned. The objective of these comparatively small-scale plantings is to secure the necessary data and experience upon which to predicate more extensive planting when that shall be deemed advisable.

At Devil Canyon the completion of a detailed topographic map of the nursery and environs occupied much of the time of Weaver and Ilch between their regular attention to the ever increasing number of rainfall and erosion instruments. Extraction of seed from cones collected for us this year by the administrative force of the San Bernardino and Angeles forests yielded a gratifyingly large amount of seed of sugar

pine, jeffrey pine, and bigcone spruce. The last named species, however, true to its usual habit, shows cutting tests ranging from zero for the Angeles seed, to 40 per cent for the San Bernardino seed. Interesting are the following comparative cutting tests of seed of identical species from northern (west slope Sierras) and southern (San Bernardino Mountains) California, the figures representing the percentage of seed found to contain apparently good endosperm:

<u>Species</u>	<u>North</u>	<u>South</u>
Sugar pine	85	79
Western yellow pine	93	77
Jeffrey pine	47	90
Incense cedar	66	30

The seed crop throughout the State this year was considered light except that sugar pine in the north and Jeffrey pine in the south were fairly heavy.

Plant Hunting

Early in the month Kraebel visited the Plant Introduction Gardens of the Bureau of Plant Industry at Chico to scout (among the introductions being grown there but not yet released to the public) for plants holding promise of usefulness either for erosion control or for establishing fireproof cover on forest firebreaks. Botanical descriptions rarely enable one to visualize the habit of an exotic plant; explorers' accounts are usually descriptive of its landscape or food values; and however good both of these may be there is still the question of how a particular plant will develop in the new environment where it is to be used. For such specific requirements as the two here mentioned no amount of description can equal the value of actually seeing the growing plant in an introduction garden. Among the half-dozen promising plants singled out by Kraebel the outstanding one is a Moroccan Ephedra, a leafless evergreen plant which, with a very limited water supply, has built up during the past seven years a densely compact mound of succulent stems about five feet high and ten feet in diameter. If such plants could be made to develop a closed cover over a forty-foot firebreak, or to form a similar cover on a ten-foot roadside strip through areas of high fire hazard, they would constitute a formidable ally to our present methods of fire control.

Cover Types

The end of November finds two field parties in the inner south Coast Range Mountains which we hope to complete this winter with the aid of two State rangers who will be assigned to the project during January and part of February.

The crew working on the intensive survey of Eldorado County in connection with the cooperative land use study with the Giannini Foundation have completed field work and are now in the office compiling the data. Both types and sites were mapped and bring out strikingly that the timber line has been pushed back by man through cutting and fire approximately 15 miles from the 1000 to the 2500 foot level. Our site index map based on age-height of remnant second-growth western yellow pine indicates that areas at an elevation of 1000 feet are capable of producing 24,000 bd. ft. per acre in 60 years. The map also shows that the foothill species such as Digger pine, Douglas oak, and Interior live oak normally found on non-timber sites move onto areas denuded of western yellow pine by cutting and repeated fires. Among the evidences giving indisputable proof of this are two cemeteries containing 60 year old 2nd growth western yellow pine entirely surrounded by woodland type and several instances of boundaries between these types coinciding with section lines or property line fences.

State Ranger Ray Clar who formerly worked on the type map for nearly four years was reassigned by State Forester Pratt to the cover type project for the winter and spring months. His headquarters are at Ukiah and he will compile a base map of Mendocino County and all existing type data available from lumber company cruises and other sources.

Erosion and Streamflow

Research men working in this field welcome the fact that the acuteness of the water problem in California and other western states is increasing the demand that mountainous areas be managed primarily for production of water rather than of timber or forage. This cannot help but bring an increased recognition of the importance of "forest influences" studies. One fact, which is often an expression of this demand, yet sometimes causes discouragement, is the constantly recurring agitation for burning the mountain areas, especially those whose cover is brush.

Range Research

November has been devoted chiefly to the establishment of eleven temporary plots in foothill types of vegetation along the "fronts" of the Stanislaus, Sierra, and Sequoia forests, with the assistance of representatives of each forest. At these temporary plots, observations on the growth and development of the important range plants will be obtained at frequent intervals during the winter. Initial observations have been recorded on provisional forms developed for the project.

Talbot attended the California Wool Growers' Conference.

One of the high lights was the adoption of a resolution favoring the burning of brush ranges in Mendocino County. The state organization further went on record as opposed to the Forest Service policy in regard to the control of brush fires in this locality.

Fire Research

Firebreak and Motorway Project

and

The fire/improvement records on the Angeles and Cleveland National Forests and of the Los Angeles County Organization have been reviewed. The location of firebreaks, fire lanes and motorways has been mapped and a record of construction and maintenance costs secured. The location of all fires whose control was effected by firebreaks, fire lanes or motorways has been plotted. Officers who were on these fires have been interviewed and the part which firebreaks, etc., have played in control has been written up in considerable detail. Records have been made of the acreage burned, weather conditions, cover, damage, costs, etc., for all such fires. The fire history of the Angeles Unit has been secured from early days (1878) to date as far as possible. With this material an effort will be made to judge the relative effectiveness of firebreaks, fire lanes and motorways. The investment represented by the construction and maintenance costs of firebreaks, etc., will be weighed against the probable suppression cost and damage savings in the case of firebreak use. From this an effort will be made to judge whether firebreaks are worth their cost which, with the annual maintenance charge, is a very large figure.

Further data were gathered on the value of firebreaks, etc., in

1. Automatically stopping fires
2. Transportation and travel routes to going fires
3. Vantage points from which to combat fires
 - a. Direct attack
 - b. Base line to hook up slop-overs
 - c. Back fire line
 - d. Safety zone for men at head of fire in dense brush cover
4. Speeding up of line building by having a ready prepared line and its estimated effect on acreage, costs and damage, taking into account weather, topography, fire conditions and man power available at the time.

This preliminary work is to a considerable degree the collection of historical data which might otherwise be lost due to the passage of time or to the transfer of individuals connected with particular cases.

Additional work will be done at a later date in studying the methods of firebreak construction. This study will be aimed at the determination of the best methods of location, building and cleaning.

Forests Products

Logging and Milling Study

Comment has been made under this heading in a previous issue regarding the correct and incorrect way of determining the marginal value of a tree on the stump. The net margin for stumpage and profit is, of course, the difference between total costs and net selling price of the lumber, but the tree giving a zero margin from this kind of balancing is not the true dead-line from the diameter selection standpoint unless the operation happens to be one requiring no special road, railroad, camp or other construction expenditures. Most operations, at least in California, do entail special camp and spur expenditures and these are usually constant per acre regardless of whether 50 per cent or 90 per cent of a given stand is to be cut. On the Stanislaus Study area, these fixed acre costs amounted to about \$35.00 (or \$54,400) a section. To determine the diameter of tree, then, which will just pay its way, the fixed acre cost should be omitted. On this basis a few comparative positive and negative margins are given below to show what 20" D.B.H. intervals mean in the four species studied on the Stanislaus. Average selling prices for 1928, 29-30 were used so the values do not reflect the very low prices of 1931. Costs are based on 1929 figures, which were practically the same as the 1928-29-30 averages.

Mixed Conifer Stand - Site I.
 Volume per Acre, approx. 59 M feet, 12" and over
 Diameters up to 80" in Sugar Pine
 Tractor Skidding; 35 mile R.R. log haul; Double Band Mill

COMPARISON 20" and 40" TREES

	: COST AND	:	:	:	:
D.B.H	: VALUE	: S.P.	: W.Y.P.	: W.F.	: I.C.
	: PER M. FT.	:	:	:	:
	: Costs (1)	:	:	:	:
20"	: Value (2)	: \$26.85	: \$27.58	: \$24.77	: \$31.58
	: <u>Value</u>	: <u>22.07</u>	: <u>24.13</u>	: <u>19.28</u>	: <u>18.71</u>
	: <u>Margin</u>	: <u>-4.78</u>	: <u>-3.45</u>	: <u>-5.49</u>	: <u>-12.88</u>
	: Costs (1)	:	:	:	:
40"	: Value (2)	: 18.25	: 19.14	: 18.43	: 17.67
	: <u>Value</u>	: <u>33.12</u>	: <u>31.27</u>	: <u>19.10</u>	: <u>20.00</u>
	: <u>Margin (3)</u>	: <u>+14.87</u>	: <u>+12.13</u>	: <u>+ .67</u>	: <u>+ 2.33</u>

- (1) Costs do not include fixed charges per acre or brush disposal
- (2) Value of 1 M feet green chain tally reduced to shipping dry basis.
- (3) Out of this margin must come fixed A costs, brush disposal (if any), and stumpage charges before figuring profit-including interest.

Fruit Growers White Fir Study

Grade production tables for logs in the Fruit Growers Supply Company white fir study were made during the month for both green and rough dry lumber. As soon as card punching of the surfacing data is completed a table of surfaced grade production will be prepared. This will be the first time in this Region that it has been possible to prepare dry and surfaced lumber production tables by log size. The results thus far indicate what was expected: that within most lumber grades boards sawed from large logs have a heavier degrade than boards from smaller logs. Lumber grade production from small, medium and large mill-run logs follows:

LOG DIAMETER						
GRADE	13		22		31	
% of Volume in each grade						
	Green	Dry	Green	Dry	Green	Dry
C Sel.	-	-	.6	.7	1.3	1.0
D Sel.	.8	.8	5.4	5.2	8.1	7.5
1 Com.	3.2	1.6	4.5	2.3	1.7	.3
2 Com.	28.7	29.0	20.4	18.0	15.4	11.3
3 Com.	51.7	48.4	40.2	41.8	32.5	34.2
4 Com.	10.7	15.4	21.6	24.2	26.9	30.8
5 Com.	4.9	4.8	7.3	7.8	14.1	14.9

Economic Research Council

At the annual meeting of the California Economic Research Council a half-day round table of the Natural Resources Section was devoted to land use, centering on a progress report by Prof. David Weeks of the agricultural phases of the joint study of land use in Eldorado County by the Giannini Foundation and the Forest Experiment Station. There was a fine attendance, specially invited for this occasion, of County Tax Assessors, farm advisors, bankers and real estate men, and the interest was surprisingly keen. It is evident that if, with the addition of the forestry phases which the Station will work up this winter, the report is as much stronger than the agricultural portion alone as it ought to be, there will be widespread support to weigh against the opposition from those whose only interest is boosting more "development" and farms, regardless of fitness of land. The State Real Estate Commissioner and the chairman of the State Bankers Association Agricultural Committee both stated to Hill that with such information more widely available they could save the State hundreds of thousands of dollars a year in ill advised developments.

Consulting Entomologist

During the season of 1926 an 80-acre plot was established on the Cascadel area of the Sierra National Forest by Person to study the susceptibility of certain trees to western pine beetle attack. It is believed that the results from this plot have been considerably speeded up during the past two seasons because of the development of a very active infestation within the area. During November Struble reworked the plot, securing data and increment cores from all recently-killed trees. In the summer of 1931 the plot was hit very hard by the western pine beetle, and approximately 15 per cent of the trees were killed.

The M. C. plots on the Pickering sale on the Stanislaus National Forest were reexamined to determine the progress of fir engraver losses. The results of this last examination are now being worked up.

Considerable time was given by Miller, Salman, Struble, and Wagner to the insect control project which was initiated on the Sierra. Two crews of 30 men each were carrying on control work in the Cascadel and Rock Creek basins until November 25, when a severe storm stopped operations for the time being. It was found that the very prolonged season of insect activity in 1931 had resulted in a complicated development of the infestation not often encountered in western pine beetle control work. It was found that during the late summer and fall an outbreak of Ips confusus had attacked and killed the tops of hundreds of yellow pine trees on the control area. At the same time emergence of the western pine beetle from trees attacked in early September was in progress during the first ten days of November, and newly attacked trees were found up to that date, when cold weather set in and activity ceased. Many of these late western pine beetle attacks were attracted to trees previously killed by Ips. This condition added greatly to the difficulties of spotting.

Extension of field work until late November has materially delayed the program of compilations and reports of the season's work. The regional survey studies particularly have resulted in the collection of an immense amount of material for analysis. Some progress has been made, however, on a summary of loss figures for all permanent sample plots set up in 1931. Detailed base maps have been drafted for all these plots, and analyses of stand and growth figures are now being worked up.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Because of the extremely crowded conditions at the Station's headquarters in Columbus, a request for additional office, laboratory and storage space has been made to the Ohio State University authorities. A conference with Mr. Carl Steeb, Secretary of the Board of Trustees, was held to consider this matter. Ground for a small experimental nursery has been allotted for the Station's use by Dr. Transeau of the Botany Department.

A nine-page mimeographed "Progress Report for Cooperators" was prepared and sent to the revised and expanded mailing list of approximately

four hundred organizations and persons interested in forestry in the Central States region. This report included brief summaries of the work and observations of the Station, which it was believed might prove of interest or of service to others.

Small quantities of black walnut and black locust seed were gathered for shipment to the Argentine. Butternuts were also shipped to the Forest Experiment Station at Keijo, Chosen, Japan.

Woodland Grazing Study Pa-1

Pinney-Purdue Study

Day joined DenUyl at the Pinney Purdue Farm for the fall examination of the carrying capacity study. All of the quadrats were retallied and the data is in the hands of DenUyl who will make a short progress report on the results of the first season's study. Rainfall records from the farm and both rainfall and temperature records from Valparaiso have been plotted and will be studied in connection with the records of weights, vegetative growth and utilization.

The steers in the twelve and eighteen acre tracts were removed on November 1, which was the closing date of the experiment. The animals lost weight in both tracts very rapidly after October 1, those in the twelve acre tract falling below the average weight at the start of the season. Those in the eighteen acre tract came out with an average gain of less than 20 pounds as compared with an average gain of over 100 pounds on August 1.

The experiment will be carried on next season under identical conditions except that an effort will be made to secure a more uniform grade of livestock. The past season's tests were made under exceptionally favorable conditions for maximum forage production and it is expected that the livestock will show losses in weight at a much earlier date next year. The livestock this past season also had the benefit of several years accumulation of forage represented in the tree reproduction and shrubby vegetation, due to the fact that the area had been only lightly grazed for several years.

It will be very interesting to observe the character and amount of the spring foliage on such species as shagbark hickory, which put out at least three crops of leaves last season, each of which was promptly browsed off. The amount of stored food in these young trees must be so seriously depleted that it seems doubtful if they will be able to produce a full crop next season.

Regeneration Study

Day has been compiling the data from the forty odd permanent sample plots established last summer by Diller and John Baker. This data will be combined with that secured in 1930 and included in the bulletin "The Regeneration of Farmwoods following the Exclusion of Livestock." The manuscript for this publication is complete but will probably require some modification following the inclusion of this year's data. Kuenzel is assisting in this compilation.

Black Walnut Yield

The work on yield of walnut plantations has been continued by Kellogg. Tables have been computed of numbers of trees, basal areas, and average diameters for stands of trees 13 inches and over (D.B.H.) This diameter is the smallest which yields a log containing board foot volume to a 10 inch top by the Scribner rule. At 75 years of age, walnut plantations on the best sites were found to contain 21 trees per acre of this diameter or larger. At the same ages and site, the average basal area was found to be 109.5 square feet, and the average D.B.H. was 14.8 inches.

Forest Litter Study

Auten spent part of the month in the preparation of a manuscript for publication, and in organizing his laboratory work for the winter. With Kuenzel he made two trips into the field for the purpose of gathering leaf samples. These samples will form the basis for a short investigation as to the variation in mineral constituents of forest litter from the same species grown on different sites.

Extensive Revision

Considerable time was spent by Kuenzel in assembling information on "Commodity Drain", as applied to fuelwood, fenceposts, telegraph and telephone poles, piling, mine timbers, hewed cross-ties, pulpwood, hardwood distillation and tanning extract wood produced in the Central States Region. Much of the information for this report has been compiled from figures of production submitted by the State Forestry Departments. Forestry officials of the large wood-using industries in the region have also cooperated in the preparation of this report.

Locust Borer Investigation

Dr. Hall and Cummings made several short field trips in Ohio and Indiana for the purpose of collecting black locust seed. These seed were

collected, both from trees that had been severely injured by the locust borer and from those trees which showed no injury.

In conjunction with the seed collecting trips, 21 additional locust borer sub-plots were established. These plots were so located as to include areas in which no plots had been established during the past field season.

A number of infested black locust trees were examined during the month to ascertain the development of the young larvae. By the latter part of the month, the young larvae had eaten through the outer and inner bark and the majority of them had started to work in the wood.

One severely injured tree, seven years of age, D.B.H. 1.4 inches, and 15 feet in height, was very carefully examined for the presence of young locust borer larvae. This tree was found to contain 191 young larvae. They were distributed in the tree as follows: from the ground level up to two and a half feet, 149 larvae, from two and a half feet up to ten feet, 43 larvae and from ten to fifteen feet, no larvae. This tree was located in a young black locust stand that had been severely injured during the past season and all indications point to severe injury this coming season. It is planned to carry on some fall spraying in this area within a short time.

An extremely large black locust seedling was received during the past month from Mr. Stanley S. Locke, Assistant State Forester of Illinois. At the end of the first season's growth this seedling measured 11.5 feet in height and .7 inch D.B.H. This seedling was grown in the State Forest Nursery at Anna, Illinois.

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NORTHEASTERN FOREST EXPERIMENT STATION

Morey joined the staff by transfer from the Allegheny Station on Nov. 1, and has been engaged in the compilation of new volume tables for northern hardwood species. Preliminary tables are being put out as quickly as possible to meet the needs of the White Mountain National Forest in connection with the revised management inventory now under way on that Forest.

Examination of the white pine stands on the chestnut replacement plots on Mount Toby, which were selectively pruned last year, showed that pruning had had no effect on the height growth and that the wounds were very largely healed over. An effort to produce high quality trees from this stand was continued by pruning one or two additional whorls from the selected trees.

Westveld remeasured a series of four plots, established in 1906 after the cutting of spruce near Waterville, N. H. Although conditions on these plots are not entirely satisfactory and some further cuttings would seem desirable now, they represent a striking contrast to areas cut over in recent years where the cutting has been more nearly complete. Westveld continued his experiments on the effect of seed bed conditions to the germination and survival of red spruce by the seeding of about forty additional spots on the Cherry Mountain plots.

Stewart has continued his examination of the more important forest plantations in the region, concentrating his efforts on the planting operations of water companies in Massachusetts. Where systematic efforts over a period of years have been made in the control of white pine weevil, the plantations show a striking superiority over those in which no control has been attempted.

MacAloney spent a few days in the plantations of the Crane Company at Dalton, Massachusetts, with Galarneau of the State Forestry Department, and Tillotson, laying out a sample area to demonstrate technique in the reclamation of severely weeviled white pine plantations. Using this area as a guide, the company plans to treat about one hundred acres of plantations which have been so badly weeviled as to appear almost hopeless until MacAloney and Cline developed their reclamation procedure. This consists in topping or girdling the most seriously deformed trees in order to afford the best formed individuals in the stand, which are usually in the lower codominant or intermediate crown classes, an opportunity to develop rapidly.

In cooperation with the Mount Toby Forests of the Massachusetts State College and the Harvard Forest, Miller has started some observations to determine the precise status of red squirrels in relation to the reproduction of white pine. The squirrels are known to destroy considerable quantities of seed each year but it is less commonly known that they may be responsible for the effective planting of much seed. By burying seed in the litter they get it down to the point where it absorbs enough moisture for germination and where the young rootlets can get in the mineral soil. In this way reproduction may be established under conditions where the natural fall of seed on the forest floor would not be able to become established.

Spaulding and Hepting worked up the data of the balsam fir rots at the Gale River Experimental Forest and prepared a paper for publication. Final notes on the permanent slash plots for the seasons were taken.

Experimental Forests

On November 12 members of the station staff held a conference with representatives of the White Mountain National Forest in which

details of the management and operation of the experimental forests were reviewed as the basis for revising the cooperative agreement set up in 1927. Satisfactory agreements were reached on a number of points on which doubt had arisen, and we are assured of the same helpful cooperation which has existed in the past between the experiment station and the national forest. Now that we have a resident superintendent on the job the experiment station will undertake to handle the administration of the sale of material from the experimental forests, subject only to price approval by the Supervisor. In the case of limited markets preference will be given to sales from the experimental forests and reduction of stumpage prices to cover unusual costs of operation involved in experimental cuttings will not be considered contrary to sales policy on the forest.

It is necessary to work in close agreement in the matter of handling sales so that no misunderstanding or dissatisfaction may arise in the minds of the public who purchase material of the White Mountain Forest. Arrangements were made for Blythe to spend some time with Ranger Spinney at Conway, as well as in the office of the White Mountain National Forest at Laconia, in order to become more familiar with administrative procedure on the forests.

On the Gale River Experimental Forest the first experimental sale involving about fifty cords of balsam and ten cords of hardwood was underway during the month. The cutting was conducted in an even aged stand of spruce and fir between fifty and sixty years of age in which there were a few scattered hardwoods, mostly of poor quality, probably survivors of the fire which ran over the area prior to the origin of the softwood stand. The cutting removed only fir in addition to the hardwood wolf trees, leaving the spruce for future growth. An operation in a young stand of this sort should make possible the profitable utilization of much fir which if left for cutting when the spruce had attained a more desirable size would contain a high percentage of rot.

The survey crew on the Bartlett Forest completed their work for the year. The inventory has been completed on the eastern half of the forest but the entire western section has been left for next season. The year's sales of fuelwood from the Bartlett tract were laid out during the month. The most accessible portions of the experimental forest have constituted the fuelwood sale unit for many years. The market has fallen off considerably in the past few years. Whereas from three to four hundred cords were sold prior to 1925, sales this year amounted to only about seventy-five cords. These sales were placed so as to block out areas cut over in previous years. Examination of some of the older cuttings shows that it will be desirable to remove by girdling some of the old hardwood wolf trees not cut for fuel, in order to make the space available for the new crop.

NORTHERN ROCKY Mtn. FOREST AND RANGE EXPERIMENT STATION

Silvicultural Studies

November saw the completion of certain stages of a number of jobs on which Haig and others have been engaged for the past several months. The white pine yield study manuscript was finished. The coding of permanent yield and thinning data, covering 5 to 15 years of field records, was also completed and forwarded to Washington for card punching and tabulation. One other job in this field, the compilation of records on some thirty semi-permanent yield plots is now practically finished. Although these last records cover only a five-year period, an analysis of the growth rates of individual plots and as class groups as compared with normal should furnish some interesting information.

November also saw the completion of another major job, the annual compilation of current records on permanent methods of reproduction and cutting plots. Opportunity has not been available to analyze these data either, but as the majority of these plots are now five years old the current summaries should prove exceedingly interesting.

Analysis of the Fire Records

Very little progress was made in November on the analysis of the fire records for 1921 to 1930, due to the greater urgency of other work. Most urgent was the need of revising the code and punch card in accordance with the revised Form 929, original fire report. Gisborne and Hornby completed this revision, which will be submitted to the Washington Office for criticism. This coding is to commence early in January so that the Forests can be saved the labor of hand-compiling six and a half of the eleven sheets A to M. It is estimated that the punch card compilation of these data will save each of the 13 western Forests an average of six or seven man days' time, and will at the same time provide an immediate comparison of fire control action during 1931 with the averages found for 1921 to 1930.

Measuring Forest Fire Danger

Gisborne also gave considerable time during November to the integration of all the important factors which control forest fire danger so that each one can be brought into the picture and a single rating obtained giving weight to at least six factors. The values assigned empirically are now being studied by several experienced forest officers in the Region with the hope that agreement can be reached so that this rating scheme can be given a trial next year.

In accordance with this objective, Jemison is coding the weather, fuel inflammability, and fire behavior records for thirteen weather and

inflammability stations located on eight Forests in this Region. Some of these records now cover an eight-year period, and from them it should be possible to determine rather precisely the weather and fuel conditions that result in various degrees of fire danger. This will serve as a check and refinement of the empirical values now being assigned on the basis of experienced opinion.

Jemison has also commenced the recalibration of the sixteen duff hygrometers used by Region 1, Region 4, and the Spokane Office of Blister Rust Control. All of the wood cylinders used for measuring the moisture content of one-half inch, inch, inch and one-half, and two inch slash have already been oven-dried to check their dry weights and the cylinders returned to their field stations for exposure throughout the winter. This insures usable measurements early in the spring as an index of the opening of the fire season. Thirty-five new wood cylinders have been ordered to augment the extras now available at Priest River for equipping additional stations. New cylinders are run at Priest River for a year so that only those of similar hygroscopicity will be sent out to other stations.

Range Studies

Watts and Hurtt spent the first week of November on a trip, mainly in the Missouri River breaks, primarily to learn of the erosion situation and to observe range conditions. Resistant rock formations are conspicuously absent in this territory, and the sandy to gumbo soils derived from weak sandstone and shales are subject to a high rate of soil movement even under most favorable conditions. Heavy overgrazing and misguided attempts at agricultural use on parts of this land have enormously increased the already high rate of soil movement. Sheet and wind erosion, gullies and river-bank cutting are all present to a conspicuous degree, and the whole erosion situation is in a very critical state. It seems inevitable that overgrazing, unwise use of the plow, and other soil disturbances will cause erosion to reach unprecedented proportions with the return of a period of normal rainfall.

The Missouri River from about the mouth of the Judith to the junction with Milk River comprises the heart of the erosion problem in eastern Montana, though serious soil movement is evident on many tributaries of the Yellowstone. The very low productive power of lands along the Missouri River is indicated by the fact that nearly half of the 6,800,000 acres of unappropriated public domain is found in a comparatively narrow strip of land along the river. Practically all of this land is too limited in productive power to have any investment value or to stay on the tax rolls. Apparently the same statement can be made for countless thousands of acres that have been homesteaded and abandoned. The prolonged drought in eastern Montana has forced as much as 75% of all livestock out of large areas the past summer and

fall because of forage shortage. Practically all of the few haystacks seen on unirrigated lands were Russian thistle hay. The Red Cross is actively in the field and very many families are already being helped.

A memorandum report has been prepared as a result of the trip. Preliminary steps involving both administrative and legislative action are suggested to meet the erosion, economic, and social problems that are the outgrowth of an outworn Federal land settlement policy and of inadequate planning. It is clear that the Federal Government can not properly sidestep its responsibility by passing these low valued and eroded lands on to state or private ownership. The use and misuse of these lands have clearly an interstate rather than a local or state significance. Sentiment of stockmen at a meeting called at Miles City to present their views on grazing matters to Congressman Leavitt was unfavorable to a grant of grazing lands to Montana.

Hurtt spent several days at the U. S. Range Livestock Experiment Station at Miles City and tentatively located pastures, water development sites, special study areas, etc., needed to get this new cooperative range study under way. The remainder of the month has been occupied in organizing the office end of the range program.

Forest Survey

Considerable time was devoted to perfecting plans for the inventory phase of the Survey. Eleven timberland types, each divided into three size classes, have been set up. Forms for collecting the data are also being prepared. Bradner gave a talk before the Forestry Club of the Montana Forest School on the scope, information to be furnished, and the mechanics of making the Survey.

Logging-Milling Studies

Anderson returned to the Office on November 6, after completing the field work on the tree study of the larch-Douglas fir type. The tie mill study combined with a chuting study completed earlier in the fall prolonged the seasonal employment period for the crew from one month to six weeks.

The portable mill studied was purely a tie mill. Hence, the wood waste was considerable from a quantity standpoint but not so bad from an economic standpoint. Market quotations from trade journals and other sources show that West Coast mills are forcing ties on the market for \$10 and \$11 per thousand feet board measure, or less than the cost of production. The Washella mill, at which the study was carried on, is now putting sawed ties on flat cars on the main line of the Great Northern Railway for \$9.50 per M feet, lumber tally. Included in this figure is a 20% margin for profit and 6¢ per tie for stumpage. While wages have been cut they are considered fair. Following is a wage schedule for

this operator: .

WOODS

Average
per day

Fellers 2¢ per tie
Teamsters .

\$ 3.50
2.65

MILL

Tie buck	3/4¢ per tie less 10%	6.10
Tail sawyer	3/4¢ per tie less 10%	6.10
Sawyer	1-1/4¢ " " " "	10.15
Cant turner	3/4¢ " " " "	6.10
Tail down	1/2¢ " " " "	4.05

None of the above mill hands work any harder or steadier than mill hands in similar positions, yet they are paid considerably better. The average monthly production of the mill studied has been 20,000 ties per month for the past two years, or 700 M feet log scale.

It is hoped to use this study as a basis for further studies in the larch-fir type and the western yellow pine type containing a heavy mixture of Douglas fir and larch. Anderson has already made tentative arrangements to study the possibilities of selectively logging the smooth or high-quality larch, spruce and pine logs for lumber and the balance for tie sawlogs. Fred Mason in charge of the logging department for the Polleys Lumber Company is now conferring with this office on this type of an operation. His company desires to adjust their woods utilization to suit the lumber market, so that during slack periods for shop lumber only high-grade shop logs will be sent to the big mill at Missoula for manufacture. The lower-grade shop logs along with rough top logs will be manufactured into ties at a portable mill in the woods. If such an operation is found economically sound it will mean a big development in better woods utilization.

Yellow Pine Volume Table

During Girard's recent visit to the Region, existing volume tables were checked and found inadequate for use in the Forest Survey project. It was suggested that a new table be prepared using data secured in the yellow pine tree studies and the breakage loss in felling study. The table will show gross volumes (breakage included) to actual utilization tops by diameter classes. A percentage figure will also be given for determining the volume of any diameter and log height class to as near a 6-inch top diameter inside the bark as the conformation of the tree will permit.

Statistics

The semi-annual revision of the circular covering cross-tie specifications and prices was completed. This circular is distributed to Forest Supervisors of Region 1 and a few other interested parties. It covers price and specification data for the Union Pacific, Northern Pacific, Canadian Pacific, Great Northern, and Chicago, Milwaukee, St. Paul and Pacific Railways.

The Union Pacific System and the Northern Pacific Railway are out of the market for the present time, while the others are taking only a limited number of ties. The Union Pacific purchasing agent indicated that not over \$12 per M would be paid for sawed ties when buying was renewed. The Great Northern paid the following prices for sawed ties on one of its most recent contracts:

7x9 - 42¢; 7x8 - 35¢; 6x8 - 29¢.

Extensive Revision

Several minor reports dealing with the Extensive Revision project were completed by Bradner during the month and sent in to Washington. The Region Four Office compiled the data on the availability of the sawlog material in South Idaho and combined them with the North Idaho figures to complete the report.

Lumber Prices and Movement

Average Mill-Run Prices	Annual 1950	1st Q., 1951	2nd Q. 1951	3rd Q., 1951
	1950	1951	1951	1951
Idaho White Pine	\$33.56	\$31.41	\$31.12	\$27.76
Western Yellow Pine	21.64	19.25	19.52	18.02
Larch-fir	17.32	14.26	13.53	13.69
White fir	16.34	13.76	13.82	11.04
Spruce	21.93	18.39	18.94	16.42

Shipment and Cut	1930	1931
	1930	1931
Shipment	128,582	72,016
Cut	106,824	70,370

PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Section of Forest Products

Lodewick made a four-day trip to Grays Harbor County, and visited several of the industries, special attention being given to the Grays Harbor Pulp and Paper Company and the Grays Harbor Veneer Company. Two mornings were spent at the latter mill studying the occurrence of "compression failure" in spruce logs.

Minor Timber Products Study

Johnson's report on the minor timber products industries of Oregon and Washington is now ready for forwarding to Washington. As stated last month, this study covered the production of poles, piling, fuelwood, fence posts, hewed ties and timber, pulpwood, shingle bolts, excelsior bolts, veneer blocks and cascara bark in these states. The actual wood material entering into these products in 1930 amounted to 213,101,544 cubic feet, approximately equivalent to 1,124,608,258 board feet. The estimated value of these products was \$13,500,000.

The total lumber cut of Oregon and Washington as shown by Bureau of the Census statistics for 1929, the latest available, was 12,086,072 thousand board feet. Assuming that a cubic foot of wood, sawlog form, will yield seven board feet, the total consumption of sawlog material for lumber only was equivalent to 1,726,581,714 cubic feet in 1929. The total log volume consumed for lumber and the minor timber products amounted to 1,939,683,258 cubic feet, of which the minor timber products consumed about 11 per cent.

Oregon White Oak

Johnson spent some time bringing together the available information as regards the utilization of Oregon white oak.

An industry which has revived after a period of years is that of extracting essential oils from the leaves of the western red cedar. Two small operations equipped with portable stills are reported in the Grays Harbor-Olympia Peninsula region.

Reppinger is completing computations on breakage losses in felling timber. Board and cubic foot volumes of individual trees were so calculated that the data could be used in preparation of volume tables with a minimum of work. Meyer for his new standard Douglas fir volume tables will use several hundred of these trees.

Forest Insurance

The climatic study still continues to take a large amount of time, though it is hoped that now it is brought very nearly to final form. Discussion of the report brought out suggestions for modifications, chiefly with respect to the use of the data on amounts of precipitation. It is planned now to write another report in a form better adapted to use by outside agencies.

Not all the time in November was, however, devoted to the climatic study. There was a considerable amount of accomplishment in furthering the damage study based on the data collected by the field analyses which are being combined with the original fire data compiled by the State Foresters for the purpose of determining actual losses and obtaining indications of proper breakdowns into the major subdivisions. This is essential to the determination of relative hazards of the various size classes.

Selective Logging in Douglas Fir

Much interest in the results of the time and cost studies is being shown by logging operators, who have studied the preliminary report which was presented at the Pacific Logging Congress in October. A number of inquiries have been received asking for further information on various phases of these studies. Interest is particularly keen in regard to yarding and roading with caterpillar tractors, which is readily explainable from a casual study of the cost table given in last month's report.

Caterpillar tractors, which are instruments for intensive selection "par excellence", occupy the coveted position of showing the lowest cost for logs of all sizes and for all yarding distances listed. This receives added emphasis when one considers that the table excludes rigging ahead and moving costs, which would on an average add about 20 per cent (from 5 to 35 per cent) to the costs listed for all machines except the tractor. Still further emphasis is added in view of the fact that yarding or roading distances may be extended indefinitely without relaying the logs, while rather strict limitations in distances apply to the other types of machinery. It costs on an average as much to "unhook" and to "hook up" a turn of logs as to actually move the turn over the average yarding distances over which the "skidder" and "yarder" usually operate.

The caterpillar studies, on which the figures in the table are based, were conducted on an operation where conditions for caterpillar logging were distinctly favorable.

To answer the question of how these figures may apply to conditions which are more typical of this whole region, we have recently worked out the results of a study conducted at Camp 5, of the Simpson Logging Company.

On this operation caterpillar tractors were employed to yard out wind-falls ahead of the felling and bucking of the standing timber. The timber was very large and averaged about 140 M feet per acre. The soil was loamy. Due to the dense stand of timber, it was rather difficult for the tractors to find their way through in many places. The topography varied from slightly over twenty per cent favorable to fifteen per cent adverse.

Below is given a comparison between times and costs on the basis of log size and logging distance. The values for Study No. 2 (the wind-fall logging) are the actual over all averages for that study, while the values for Study No. 1 are read off from the tables prepared for that study for the average log size and yarding distance that applies to Study No. 2.

COMPARISON OF TURN TIME AND COST OVER A YARDING DISTANCE OF 1370 FEET

Study Number	Average Log Volume	Average Turn Volume	Haulback	Hauling	Delay Time	Side-line Time	Hook and Unhook Time	Total Trip Time	Time per M.	Cost per M.
Study 2	1280	2272	5.37	8.07	3.68	.09	5.58	22.79	10.03	0.96 (1.27)
Study 1	1280	2235	5.27	7.31	1.27	.18	3.42	17.45	7.81	0.86
% Deviation from Study No. 1		+1.65	+ 1.90	+10.40	+189.76	-50.0	+63.16	+30.6	+28.42	+11.62 (47.67)

It is worthy of note that very close agreement exists between the two studies in regard to the volume of the turn (that corresponds to the given log size) and to the haulback time. Hauling time shows only a ten per cent increase. The principal differences between the two studies occur in "delay" time and in "hooking and unhooking" time. The greater delays are to a large extent due to the density of the timber which made it difficult to turn around. The greater "hook and unhook" time may be in part explained by the fact that a smaller crew was employed in the windfall yarding. In Study No. 1 the crew for each complete tractor unit comprised 4.04 men, while only 2-1/2 men were employed in the windfall yarding. This explains why the cost of the windfall yarding is only 11.62 per cent higher than in Study No. 1, while the time per M is 28.42 per cent higher.

A further increase in cost occurs, however, in Study No. 2 due to the fact that a "helper tractor" had to be employed in getting the loads over the rather steep adverse grades (18 per cent maximum). This raised the cost from \$.96 to \$1.27 per M and the percentage deviation from 11.62 to 47.67 per cent. It was observed in the study that one "helper cat" could very well have served three or four "yarding cats" instead of only two (but during the period of the study there were only two tractors available).

The indications from this "check study" are that, barring steep adverse grades (and wet weather) one need not anticipate any pronounced increase in costs in translating the figures listed in the Summary table (printed last month) to more typical Douglas fir conditions; possibly no more than the differential in rigging ahead and moving costs which favors the tractor in comparing it with other types of machines. It would be desirable, however, to have a few more "check studies" before drawing any general conclusions.

Forest Survey

All the men working on the survey on the national forests were on office work in November. Field work on the Mt. Baker and Siuslaw Forest was stopped due to weather conditions. This November was the coldest since some time in the '90's, and all country above 2,000 feet is snow-bound.

One of the big problems puzzling the survey personnel on the national forests is the correlation of their area values as obtained from their field work-sheets with the areas as published in the official annual statistical report. On each forest the survey field man has used a 1-inch-to-the-mile blue line print base map made from a negative which had been enlarged from the latest forest base map. In the field he has drawn all the type lines on his blue line prints. When he comes into the office in the winter, these blue line print base maps with the type lines drawn on them are planimetered for type areas. It is

to be expected that these planimetered values will not jibe with the values in the annual statistical report, even when shrinkage of the paper and correction for the error in the individual planimeter have been allowed for.

Why, after allowing for normal errors of planimetering and map shrinkage, should these discrepancies occur? Mostly because the Forest Service maps for some reason or other do not seem to be in harmony with the status records in the Office of Lands. For surveyed townships the planimetered values seldom differ more than a fraction of a per cent from the official value and this very small error represents the normal human error involved in handling a planimeter. It is in the unsurveyed portions of the forest where the big discrepancies occur, and every forest in R-6 has plenty of unsurveyed country within its boundaries.

The checking of the field work on the national forests by the survey's check cruisers was stopped, due to the excessive snow. The check cruising and mapping in place have been continued on private lands at the lower elevations. Two men have continued on the compilation of data for one release unit.

Fire Studies

Reporting and Charting Lightning Storms

Morris has tabulated the information on the storm day maps in such a way that it is possible to tell at a glance whether a general, intermediate, or local storm occurred in either the Blue Mountains, in Washington, or in the Cascades of Oregon on any given date during the summer months of the past seven years. Descriptive notes regarding the time of occurrence and type of the storm progress have been tabulated by symbols for each day.

Time Factors in Fire Control

The "hour control" study is again in progress - this year the west side forests are being studied. Important differences are being found, not only between these forests and the east side forests analyzed last year, but also to a very marked degree between individual forests. Men from the Mt. Baker, Siuslaw, Columbia, Snoqualmie and Olympic National Forests reported during the month for duty on these studies. Three other forests are scheduled for study next month.

Fire-Weather Forecasts

Mr. W. E. Stevens, newly appointed head of all fire-weather warning units in the country, was a visitor during the month. Munger and McArdle

discussed with Messrs. Stevens and Dague the various aspects of the fire-weather service, pointing out our needs and suggesting ways that we might assist in improving the forecasting work. We suggested particularly that our lightning storm maps be used in connection with synoptic weather maps to determine more precisely the underlying causes of lightning storms.

Silviculture

Douglas Fir Natural Reproduction

While at Wind River, Isaac made the final examination of the various reproduction studies under way there. The crop of 1931 seedlings was far below that expected from the medium seed crop of 1930; however, the seedling losses were not as heavy as in previous years. On the sample plots where physical factors are being measured, the average seedling loss in 1931 was 60.6 per cent as compared with 94.7 per cent in 1930. The mild weather in the early summer of 1931 resulted in no loss from direct heat injury, a cause that has taken a heavy toll of seedlings in previous years. This year's losses were credited entirely to drought.

Wind River Arboretum

Kolbe and Munger spent several half days revising the arboretum records as a preliminary to a report on the 400 and more lots of seed already tested at Wind River.

This past month over a hundred packets of seeds were distributed to research organizations and arboreta on four continents. For the first time in many years we were able to obtain seed of alpine larch (*Larix lyallii*) for trial at Wind River. We were also fortunate in receiving from the Argentine National Arboretum on Isle Victoria in South America a quantity of Chilean cedar (*Libocedrus chilensis*) seed, which will undoubtedly thrive out of doors in the West Hills Civic Arboretum in Portland if not in the more severe climate of our Wind River area.

Methods of Cutting Western Yellow Pine

Kolbe spent the greater part of the month tabulating the data collected during the past field season on the plots in central and eastern Oregon. One plot on the Deschutes Forest on which the effect of slash on reproduction has been studied for a five-year period since logging shows definitely more reproduction per acre on the area with slash than on the plot where it was piled and burned.

Mensuration

During the past several weeks, most of Meyer's and Litchfield's time has been spent on Douglas fir stem analyses in preparation for an investigation of the volume of this species covering the entire range. Several thousand new stem analyses for this particular region, heretofore appearing in no volume study, are now available for this purpose.

Miss Frisvall's first task at this Station has been the analysis of the effect of site, structure, and reserve upon the basal area and volume growth of selectively cut stands of western yellow pine. The basic growth tables, representing so to speak the normal values, are those drawn up last winter by Meyer and published in one of our Forest Research Notes.

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SOUTHERN FOREST EXPERIMENT STATION

Forestation

Wakeley, in seed extraction tests, found that sound slash pine cones yielded about twice as much clean seed per bushel of closed cones as did cones infected with insects.

Gemmer found squirrel damage to the longleaf seed crop in western Florida varied from 0 to 100 per cent for different trees, and averaged about 60 per cent. At least 60 per cent of the seeds extracted from the cones collected were blanks.

Naval Stores

Members of the Association of State Foresters visited both the Starke and Olustee experimental tracts in Florida at the time of their annual meeting. At Kingsley Lake they were shown a recent thinning operation in progress. Trees on the thinning plot turpentine with French faces were being cut out, leaving 200 round trees per acre. The wood removed in this thinning amounted to about 12 cords per acre.

At Sampson Lake eight or ten trees on the experimental area had to be cut and peeled to stop an attack of Ips beetles. The infestation was probably favored by the recent prolonged drought, when only about 1-1/2 inches of rain had fallen in over thirteen weeks.

Office computations on correlation of weather factors and hourly gum flow have been practically completed. The last dipping of the 1931

season has been made and work in cooperation with the University of Florida has been discontinued until next spring.

Management

Wakeley, Bickford, and Huberman made the annual cone counts on longleaf pine Method of Cutting plots at Bogalusa. On the Olustee Experimental Forest about 700 longleaf pine seed trees were tagged, measured, and cones counted. These trees range in age from 10 to 100 years and grow in stands of various densities.

Wahlenberg and Huberman made the winter season counts of longleaf reproduction on the grazing experiment at McNeill.

Wahlenberg installed a preliminary test at McNeill to determine the effect of periodic light burning on longleaf pine reproduction.

In working out the details of the silvicultural use of fire in pure stands of longleaf pine, particular attention must be given to the intensity and frequency of fires. Our studies of longleaf in relation to fire have been hampered by our inability to determine the age of seedlings within reasonable limits of accuracy. Neither with hand lenses in the field nor with a compound microscope in the laboratory have we been able to decipher definite growth rings in small longleaf seedlings. When in the grass stage, the rings of wood laid on near the pith are indistinct, apparently because of (1) little differentiation in the cells, and (2) numerous partial and false annual rings. Much of the difficulty in determining annual rings may be caused by intermittent growth periods in winter. Some alternative method of judging age in longleaf seedlings would be highly desirable.

Heyward collected soil samples from burned and unburned areas at Urania, Louisiana, McNeill, Mississippi and Chipley, Florida, for chemical analysis. He is also experimenting with a lysimeter of the funnel type for studying the decomposition of slash and longleaf pine litter.

Ecology

Pessin has drawn up a preliminary report on his studies of root competition at McNeill, to be presented at the annual meeting of the Ecological Society of America. He also plans to report on the major plant communities and forest associations in the uplands of the lower Gulf Coastal Plain.

Pessin accompanied by Dr. F. E. Clements of the Carnegie Institution on a field trip in the vicinity of New Orleans. Dr. Clements seemed convinced that the prevalence of pine stands in the South may be ascribed

to fire. In his opinion the elimination of fire would cause extensive areas to revert to an oak-hickory association, which he regards as the climax type for the region as a whole.

Erosion

The erosion control plantings of March 1931 were reexamined. Low survival of certain species seems to have resulted from poor stock and a dry season following planting. Some locust borer damage, chiefly restricted to the larger trees, was noted.

Meginnis took C. G. Bates on a trip through the most seriously eroded portions of the brown loam region. They also visited the laboratory of the Mississippi Waterways Experiment Station at Vicksburg, Mississippi.

Forest Survey

The hardwood mill scale studies were continued throughout the month in Louisiana, Arkansas, and Tennessee, at six different mills. Besides giving some time to this work, Granger, Girard, Lentz, and Putnam measured a number of oak and red gum trees to check and strengthen existing volume tables. The cull factor for cypress was strengthened by scaling 1,200 additional logs.

The general procedure for the final hardwood survey has now been decided upon, following conferences at which Schumacher sat in. It was agreed that the lines shall be run 10 miles apart and 1/4-acre plots taken every 10 chains. Early in January the survey of the 5,600,000 acres of the Delta bottomlands in Mississippi will be started.

In the preliminary pine survey now under way in Pearl River County, Mississippi, plots of two sizes, 1/4-acre and 1/40-acre, are being taken at each location. In order to save time, trees up to 6 inches D.B.H. will be tallied for the smaller plot only.

For the construction of a virgin longleaf volume table and the table drawn up by a scheme suggested by Girard, 127 trees were measured.

Hardwood Growth

While on the hardwood mill scale study, Winters and Bull paid special attention to the grades of lumber obtained from second-growth logs. In the results of the hardwood growth studies they will estimate the proportions of various lumber grades represented in each tree. The accuracy with which this can be done will determine the value of predictions involving both quality and quantity of product.

Active field work got under way in measuring even-aged second-growth red gum stands, for yield table preparation.

Forest Pathology

Siggers and Ricbold returned from a 5,000 mile extensive survey in the longleaf pine region from Texas to South Carolina. They gathered information on the prevalence of the brown spot needle blight and the relation of this disease to fire.

Products Pathology

Dale Chapman completed work on the commercial tests started in October with a number of chemicals showing promise in the prevention of deterioration in stored logs. Tests of four new treatments were started. Two technical papers on the stain and mold problem have been prepared. The aspect of the stain control problem as it affects the small mill was studied in Mississippi, and some attention was given to the best methods of safeguarding workmen against injury from chemicals.

SOUTHWESTERN FOREST & RANGE EXPERIMENT STATION

General

The annual influx of field men into the Tucson office for the winter began with a rush near the end of the month. When the Rio Grande Erosion Survey party broke up, Hendricks and Merrick moved into Tucson, while Bond and Lewis returned to the Regional office at Albuquerque. Bond will come into Tucson to assist in assembling the data gathered during the past summer. Heavy snows at Fort Valley forced Cassidy to close up the field season on the Range Management in Western yellow pine project. Campbell plans to take leave for post-graduate work at the University of Chicago. Mrs. Todd arrived from the Madison Laboratory early in the month, and started immediately upon statistical work.

Timber Growth Studies

Krausch has recently remeasured and compiled the records of an 8-acre western yellow pine sample plot on the Coconino, the results of which are of unusual interest. Although the records are only 5 years old, they bring out some very significant indications, and these

are thought to be reliable because they are in accord with previous findings.

The plot was selected because the stand is different from older sample plots of this station, and yet it is typical of considerable areas on the better sites of the Colorado Plateau. The original volume is placed at 21,000 board feet per acre, of which 6,867 board feet were retained in cutting. These figures are about double those of average Coconino stands. Unlike all the other sample plots, the stand is made up mainly of large trees. It is the behavior of these trees that constitutes the main point of interest. The most essential facts are brought out by the following table:

D.B.H. class	: No. of		: Av. Annual growth per tree :			: Mortality	
	: trees :		: inches :			: % of	
	: on plot :		: d.b.h. : cu. ft. :			: volume	
4-11	14		.179	.29		0	
12-20	39		.186	.97		0	
21-30	37		.185	2.40		0.8	
31-34	10		.114	1.96		0	

Annual increment per acre, F.B.M., trees over 11 inches d.b.h., gross 119, net 83. The entire mortality on the plot is represented by one 29-inch windfall.

Opinions may differ as to the advisability of leaving so many trees above 20 inches d.b.h. The average number per acre is 5.9. Seed requirements according to the standards advocated in Bulletin 1105 call for 4 trees per acre of this size class. This standard is seldom attained in practice because usually so many desirable seed trees above the 20-inch limit are not found on an acre. Conditions would justify the maximum number of seed trees because reproduction was almost totally lacking at the time of cutting. The plot bears a fair representation of 1928, 1929 and 1950 seedlings, all germinated since the cutting.

Increment figures seem to warrant leaving the trees in the 21 to 30 inch diameter class. There is less certainty about the 31 to 34 inch class, although diameter growth is good. Although no mortality occurred in this class, experience on older plots indicates that this record will not be long maintained. What is important is that large trees selected for good crowns do make substantial growth. Obviously, it would be better to have more of the residual trees in lower diameters, but if they are not there the alternatives are to leave large trees or reduce the growing stock until increment falls to a very low figure.

Lexen spent the month of November at Fort Valley checking up sample plot records in the office and in the field, with a view toward compiling a growth table based on 1-acre plots. The intensive sample plots of western yellow pine in the Flagstaff region aggregate about 100 acres. On these plots all trees are tagged and located on a map. The records are from 15 to 20 years old. With the aid of the map, each plot will be subdivided into a number of 1-acre plots which presumably will show considerable variation in volume of growing stock and increment. By combining the acre plots from all the sample plots there should be a gradation of volumes ranging from say 1,000 up to 4,000 board feet per acre, and corresponding increments. Thus we will have a growth table giving increment per acre for cut-over stands of different degrees of stocking. It is the practice in Region 3 to caliper areas after they have been logged. Having the volume thus obtained, the increment for each section can be read from the table.

Rio Grande Watershed Survey

The field work on the Rio Grande watershed survey for the portion of the watershed within New Mexico and above Elephant Butte was completed on November 20. During September and the early part of October, the party was handicapped by heavy rains which made travel in areas where travel was necessary almost impossible. Fair weather made possible the speeding up of work during the remainder of the season.

The general plan of work was to divide the watershed into large drainage units, and to determine the general condition of cover and character of erosion on each. Then representative drainages within the various units were studied in more detail. Also, the extent of areas similar in condition to selected drainages was determined. The availability of grazing reconnaissance maps and data for the national forest areas within the watershed made it possible for the party to devote more attention to lands outside the forests where the erosion problem is more serious.

The examination of the watershed required approximately 7,000 miles of travel with two cars, most of it over rough roads. Records on relationships existing between vegetation in disturbed and undisturbed states and degree of soil stability were taken for all the primary cover types occurring on the watershed. Many photographs supplement the written records.

Some of the most apparent indications in the field are:

1. Accelerated erosion is very widespread over lands outside the national forests. Few areas support a density of vegetation capable of holding the surface soil intact. The original vegetation occurring on these areas has been depleted. It has been supplanted by an inferior cover which is only partially effective during the growing season, and

which may have no effect in retarding runoff from early summer rains.

2. About one-third of the total drainage area is characterized by wide valleys of deep alluvial soil derived from the unconsolidated sandstones and shales of cretaceous origin. Water courses originating near the heads of these valleys erode from the valley floors and transport to the Rio Grande River tremendous volumes of silt. If the rate of deposition of silt in Elephant Butte Lake is reduced the vegetation on the drainages must be restored to a type approximating the original condition.

3. Conditions in the Rio Grande Valley below Elephant Butte Dam have changed so that lands formerly subjected to flooding are now occupied because floods are held back by the storage reservoir. Flow in the river is now insufficient to scour out the lower part of the channel and carry the silt downstream so that silt accumulation between Las Cruces and El Paso has raised the bed of the channel higher and higher. If Elephant Butte Lake is filled with silt, the destructive floods originating in the upper valley will overtop the dam and destroy property and life in the lower valley. Judging by silt surveys made by the Reclamation Service, the remaining life of the reservoir can not exceed 115 years, and probably will be considerably less. The seriousness of the situation is apparent.

Range Management in the Western Yellow Pine Type

A heavy snowfall definitely halted field work of the range management study at Fort Valley. This completes the fifth year of recorded history of damage to over 2,500 western yellow pine seedlings, largely from the 1918 seed crop.

The compilation of damage data in relation to allied factors is now under way at the Tucson office. The data is being put in shape for recording on punch cards, and it is expected that by next spring at least tentative conclusions may be drawn from the results obtained.

Jornada Experimental Range

The annual fall roundup and count of cattle was completed. Ares worked with the outfit during the entire period and was able to secure a fairly good count of the cattle as well as an intimate knowledge of the character and extent of the Jornada range. For the first time since 1926, the cooperater failed to sell his calves and move them off the range during the fall roundup, but cows and calves are in excellent condition. Winter range is good, and all stock should winter in good condition.

Campbell worked up the data for the summer 1931 forage crop report, which shows that, in general, the growing season was very favorable. Of

seventeen rain gauges, the lowest record for the summer growing season was 4.55 inches, slightly below average, and the highest was 9.66 inches, so that the precipitation in all pastures was either average or above. There were some spots on the range where summer feed did not develop satisfactorily, but winter range matured well over the entire area. Feed in the mountain pasture is in better condition than it has been for years.

The fall quadrat charting schedule was completed and Keller started on quadrat compilation. The clipping study schedule was finished, the quadrats were charted.

Campbell prepared the first draft of a paper, "Notes on the Growth and Reproduction of Yucca elata", to be presented at the New Orleans meeting of the A.A.A.S. The report covers the results of seven years' measurements of selected Yucca plants. An average height growth of approximately one inch per year was recorded for mature plants and sprouts, but seedling reproduction of Yucca was found to be very rare. On 170 meter square quadrats now on the Jornada, only ten Yucca seedlings have been observed since the plots were established. Of the ten seedlings six were alive in 1931, and although three of these were on quadrats established in 1915, none of them had made sufficient height growth to be measured even in 1931. Rodent cutting of the leaves is largely responsible for this slow development.

Director Pearson made a four day inspection on the Jornada, considering all of the work with the staff, both work plans and in the field. Considerable attention was given to pending manuscripts.

Hendricks and his Rio Grande erosion survey party, including Bond, Lewis, and Morrick, visited the Jornada to familiarize themselves with the Jornada studies. Hendricks and Campbell examined the erosion situation in the Mesilla Valley and spent a day in El Paso, Texas, gathering data from the Reclamation Service and from the International Water Commission.

Field work on the mesquite sandhill restoration project began on November 23. The first work was to gridiron the 640 acre enclosure with iron stakes, 5 chains apart. Part of the enclosure was covered but the weather became so cold and severe, with considerable snow, that work was discontinued for this year. It is planned to complete the gridiron in July, 1932, and to make the intensive reconnaissance of the area a month afterward.

H

R-2 RESEARCH ACTIVITIES

On the first day of the month Roeser completed the season's field work at Fremont. The final job before leaving was to weigh the wood cores obtained on the brush disposal plots in Este Gulch of the Black Hills to determine, if possible, the rate of decay of brush under various kinds of treatment.

Williamson spent most of his time in trimming up logs, scattering brush, and skidding in the winter's log supply from the experimental forest management plots which had been cut over during the summer. During his assignment at Fremont, Smith, who was a member of the technical staff of the Experiment Station last winter, will take care of the routine weather, type study and greenhouse observations, and in addition will compute and tabulate the soil moisture data obtained at Fremont during the 1930 and 1931 field seasons.

Upon returning to the office in the middle of the month, Roeser busied himself for a week or more with correspondence and other administrative matters, which had been neglected toward the end of a very busy field season, and also with the Station library compilation index and photographic files. The results of the 1931 examination of the South Platte plots on the Pike Forest, where the effect of grazing upon western yellow pine planting and erosion is being studied, were compiled, analyzed and reported upon. The results of this latest examination provide little additional information to what has already been determined. Some changes have occurred in the vegetative cover, both where protected and where grazed, but these are attributed to the severe drought of the past season, since they are quite similar on both areas. The grass cover has decreased in area somewhat, since the study was started in 1919, while the herbaceous growth has shown a steady and pronounced increase, especially on the non-grazed area. A decrease of approximately 10% in areal distribution has taken place since the first examination was made in 1921. It is too early to determine the possible effect of these changes upon erosion conditions and upon the development of the plantations.

Probably the most important feature of the recent examination of the plots involved a determination of the degree of porcupine damage suffered within the past half-decade, and which has introduced a situation which is seriously influencing the primary object of the experiment. Approximately 5/8 of the trees within the fenced and protected area have been damaged to a greater or less extent, and about 1/2 of the number on the open range. The greater amount of activity inside the fence may be attributed to the presence of a more profuse stand of succulent herbaceous ground vegetation. Fortunately very few trees have been killed outright, although a decline of about 30% in the average growth rate has been experienced. Such a set-back is serious, especially under natural conditions which are not conducive to fast growth. Under

normal growing conditions on this site the average rate of height ^{growth} is about 3 inches per year during the first decade.

Control measures have been undertaken against the porcupine and no doubt, will be continued in order to hold the depredations of the pest to a minimum.

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